

REMARKS

This responds to the Office Action mailed on September 20, 2006.

Claims 1, 3-13 and 23-33 are pending in this application.

§102 Rejection of the Claims

Claims 1, 3, 4, 11 and 12 were rejected under 35 USC § 102(e) as being anticipated by Wachtler et al. (U.S. 6,274,391).

The **Response to Arguments**, proffered in the Final Office Action, states that “Wachtler *explicitly* states that a semiconductor device (16) is secured within cavity (14) of substrate (12) by adhesive [col. 8, lines 53-55], where the adhesive is thermally conductive [col. 8, lines 55-59].” (Final Office Action at page 3. Emphasis added). This statement by the Office is not germane to the *specifics* of what is claimed, namely, “adhering ... *die back surface* to ... *recess bottom surface*”.

The following table shows Wachtler’s cited teachings, and claim 1.

| Claim 1 | Wachtler |
|---|--|
| a thermally conductive material | device 16 is secured by adhesive material or other similar means (col. 8, lines 54-55) |
| adhering said at least one microelectronic die back surface | device 16 is secured within cavity 14 of substrate 12 (col. 8, lines 53-54) |
| to said recess bottom surface | -- |

Thus, Wachtler is not *explicit* on teaching “adhering ... *die back surface* to ... *recess bottom surface*”. Here is what Wachtler is explicit on teaching:

| Wachtler | Located at | Comments |
|--|---------------------|--|
| Once a substrate or packaging material 12 has been selected, a cavity 14 is formed or milled out in material 12, as shown in FIG. 8, to a dimension slightly larger than the semiconductor device. | Col. 8, lines 47-50 | The only dimension slightly larger than the semiconductor device 16 is the lateral dimension of cavity 14 “slightly larger” than the device 16 |
| Next, a semiconductor device 16, having at least one optical transmitter and/or receiver, is positioned manually or by machine (i.e. pick and place machine) within cavity 14, | Col. 8, lines 50-53 | “Next” means immediately following forming or milling the cavity 14 |

| | | |
|---|---------------------|---|
| as shown in FIG. 9. | | |
| Semiconductor device 16 is secured within cavity 14 of substrate 12 by adhesive or other similar means. | Col. 8, lines 53-55 | Since there is no space illustrated between structure 16 and 12, but there is space 14 between structure 16 and 12 laterally, this is the only place Wachtler teaches placing an adhesive |
| If adhesive material is used, the die attach material may have a high or low modulus of elasticity, be thermally conductive or non-conductive and electrically conductive or non-conductive depending on the die characteristics and system end use application. | Col. 8, lines 55-59 | “If adhesive is used” means the device 16 can be “positioned manually or by machine within cavity 14” without adhesive. This makes sense in any event since the only place to |
| The adhesive material may or may not fill the gap between the edge of the semiconductor device 16 and the cavity 14 depending on the desired separation of the semiconductor device material from the substrate material. | Col. 8, lines 59-63 | This teaches the adhesive material is in the gap between the edge of the semiconductor device 16 and in the cavity 14 |
| The <i>surface</i> of semiconductor device 16 opposite cavity 14 <i>should ... be flush with the surface of substrate 12</i> having the cavity formed therein to facilitate the formation of a thin film overlay (not shown). | Col. 8, lines 63-68 | The flush alignment is achieved by milling, as taught above, and the lateral gap between 16 and 14 and <i>no gap between 16 and 14, below 16</i> shows the only place for Wachtler’s <i>optional</i> adhesive, is in the lateral gap. |

Applicant notes that the Final Office Action is silent on the specifics of “adhering ... die back surface to ... recess bottom surface”. The Office Action again asserts that “Wachtler explicitly teaches the claimed invention in column 8, lines 53-59” (Office Action at page 4), which assertion Applicant has refuted, in particular, where Wachtler does not explicitly teach “adhering ... die back surface to ... recess bottom surface”.

The Office next cites to *In re Fulton* to assert an alternative does not teach away unless the reference does “criticize, discredit, or otherwise discourage the solution claimed” (Office Action at page 4, citing *Fulton*). The Applicant respectfully asserts that Wachtler discourages the limitations of claim 1 set forth above.

Wachtler discourages placing anything between the die back surface and the recess bottom surface because Wachtler illustrates no space for an adhesive between structure 18 and structure 16 at the backside surface thereof. This reveals an inherent teaching that discourages teaching “adhering ... die back surface to ... recess bottom surface”.

Wachtler discourages placing anything between the die back surface and the recess bottom surface because Wachtler's drawings, except for FIG. 18 are implied to be accurate to scale. Wachtler only disclaims as "not to scale" with respect to FIG. 18. Absent Wachtler having a global disclaimer of "not to scale" and in the presence of Wachtler's single disclaimer for a single figure (FIG. 18), as "not to scale", the implication favors the interpretation that all other drawings are to scale. Wachtler therefore discourages placing anything between the die back surface and the recess bottom surface, and where no structure is illustrated between the cavity floor 14 and the die 16.

Wachtler discourages placing anything between the die back surface and the recess bottom surface because Wachtler teaches the "primary thermal path for the semiconductor device 16 is to the air which is very short because the semiconductor device is *attached directly* to the substrate or packaging 12". (Wachtler at column 8, lines 18 et seq). "Attached directly" implies nothing is therebetween. Wachtler teaches the adhesive is optional, and "attached directly" without adhesive, meets the teaching of "a semiconductor device 16... is positioned manually or by machine ... within cavity 14, as shown in FIG. 9. This reveals an inherent teaching that discourages placing anything between the die back surface and the recess bottom surface.

Wachtler discourages placing anything between the die back surface and the recess bottom surface because Wachtler, who is vitally interested to "optimize heat dissipation" (Wachtler at column 2, line 26), teaches that "[i]f adhesive material is used, the die attach material may ... be ... thermally non-conductive." (Wachtler at column 8, lines 56-57). Thus, adhesive material may not be used, but if it is, it may be thermally non-conductive. This teaching of using a "thermally non-conductive adhesive" militates further away from inserting the adhesive between the die 16 and the substrate 12, but not in the gaps as he teaches. This reveals an inherent teaching that discourages placing anything between the die back surface and the recess bottom surface.

Wachtler discourages placing anything between the die back surface and the recess bottom surface because Wachtler states and illustrates, and Wachtler only teaches that the "adhesive material may or may not fill the gap between the edge of the semiconductor device 16 and the cavity 14". (Wachtler et al. at col. 8, lines 60-61). This, accompanied with his teaching of "if adhesive material is used" (*supra*), further discourages placing anything between the die

back surface and the recess bottom surface. The Final Office Action states that “the figures of Wachtler et al. are not drawn to scale.” (Final Office Action at page 3). But the only reference Wachtler makes for “not to scale” is with respect to FIG. 18, not the junction of items 12 and 16 in FIGs 9-22 and all others except FIG. 18.

Wachtler discourages placing anything between the die back surface and the recess bottom surface because Wachtler illustrates no space for an adhesive between structure 18 and structure 16 at the backside surface thereof. This reveals an inherent teaching that discourages placing anything between the die back surface and the recess bottom surface.

Wachtler discourages placing anything between the die back surface and the recess bottom surface because Wachtler teaches “*surface of semiconductor device 16 opposite cavity 14 should ... be flush with the surface of substrate 12*”. An adhesive placed between the back surface of structure 16 and the mating surface of structure 12 would discourage making a “flush” match of surfaces. An adhesive at the edges, however, that “may or may not fill the gaps”, does not discourage achieving the structure 16 being “flush with the surface of the substrate 12” (Id.) This reveals an inherent teaching that discourages placing anything between the die back surface and the recess bottom surface.

Wachtler therefore fails, both expressly and inherently, to teach what is claimed regarding “a thermally conductive material *adhering* said at least one microelectronic die *back surface* to said recess *bottom surface*”. (Claim 1, emphases added). Because “[t]he identical invention [is not] shown in as complete detail as is contained in the ... claim” (*Richardson, supra*), Wachtler et al. does not anticipate claim 1. Withdrawal of the rejections is respectfully requested.

§103 Rejection of the Claims

Claim 6 was rejected under 35 USC § 103(a) as being unpatentable over Wachtler et al. in view of Shibamoto et al. (U.S. 6,563,212). Applicant respectfully traverses the rejection and requests the Office to consider the following.

Claim 6 depends from claim 1. Wachtler et al. only teaches that the “adhesive material may or may not fill the gap between the edge of the semiconductor device 16 and the cavity 14” (Wachtler et al. at col. 8, lines 60-61), and Wachtler et al. illustrates no space for an adhesive

between structure 18 and structure 16 at the backside surface thereof. Thus, although Shibamoto may teach various adhesives, they cannot be located where claim 6 requires. Shibamoto has nothing to do with “a heat spreader having a first surface, said heat spreader having at least one recess defined therein by at least one sidewall extending from said heat spreader first surface to a recess bottom surface” (Claim 1, from which claim 6 depends). Withdrawal of the rejections is respectfully requested.

Conclusion

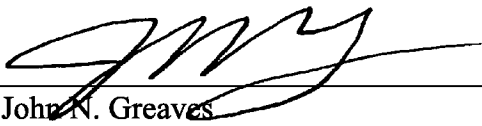
Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant’s attorney at (801) 278-9171 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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